

Reply to “What is the evolutionary disadvantage of migraine?”

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We thank Dr Marco Lisicki and Dr Jean Schoenen for their interest in our study¹ and their insightful response,² which expands the discussion on the evolutionary meaning of migraine. They observed an inverse correlation between migraine prevalence and the Biological State Index (BSI), a metric reflecting the strength of natural selection in a population, with higher values indicating stronger selection pressures. In other words, based on their findings, migraine is more prevalent in populations experiencing “relaxed natural selection” and less common where selective pressures remain robust. This observation aligns with the theory that **migraine traits may have conferred an evolutionary advantage in the past but have progressively become maladaptive**.^{1,3,4} Therefore, populations still subject to natural selection have only partially experienced the sharp rise in migraine prevalence or have seen a decline in its occurrence. Notably, this transition from an adaptive to maladaptive trait is likely reflected in the progression from low-frequency to high-frequency/chronic migraine (i.e. the pathological process is the chronification of migraine rather than migraine itself).⁵

Most modern societies have experienced a near-complete absence of natural selection due to dramatic shifts in human lifestyles and a substantial improvement in medical care. As a result, traits that once conferred an evolutionary advantage persist, even when they are no longer beneficial or have become even harmful. A striking example, beyond migraine, is the persistence of genetic traits that promote food cravings and efficient energy storage, which were once essential for survival but now contribute to the soaring prevalence of metabolic syndrome in populations with minimal, if any, natural selection (i.e. low BSI).⁶

In the absence of natural selection, cultural shifts can, and should, serve as a substitute for evolutionary processes. Unlike genetic adaptation, which requires hundreds of generations to unfold, societal changes have the potential to promote health benefits within a single lifetime.⁷


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